EPA/ROD/R10-99/059
1999

EPA Superfund
Record of Decision:

HANFORD 100-AREA (USDOE)
EPA ID: WA3890090076
OU 29
BENTON COUNTY, WA
09/17/1999

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

USDOE Hanford 100 Area EPA ID# WA3890090076
100-KR-2 Operable Unit
Hanford Site
Benton County, Washington

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for the K Basins in the U.S. Department of Energy (DOE) Hanford 100 Area, Hanford Site, Benton County, Washington. The selected action was chosen in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act of 1986* (SARA), and to the extent practicable, the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). This decision is based on the administrative record for this site.

The State of Washington concurs with the selected remedy.

ASSESSMENT OF SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances from the K Basins into the environment.

DESCRIPTION OF SELECTED REMEDY

The selected remedy is an interim remedial action to mitigate the potential to release hazardous substances from the two 100-K Area spent nuclear fuel (SNF) storage basins. Completion of this interim remedial action prepares the basins for remediation as waste sites 100-K-42 (K-East Basin) and 100-K-43 (K-West Basin) under the July 1999 100 Area Remaining Sites Interim Action ROD. The major components of the selected remedy in this K Basins ROD consist of the following:

(**Remove SNF from the K Basins.** In the basins, the SNF will be loaded into baskets, the baskets loaded into multi-canister overpacks, removed from the K Basins and transported to the Cold Vacuum Drying (CVD) facility located in the 100 K Area. This interim remedial action will be completed upon receipt at the CVD, although it is expected that the fuel will be dried at the CVD, then transported to the 200 Area of Hanford for underground vault storage at the Canister Storage Building, and ultimately disposed off-site at the national geologic repository.

(**Remove sludge from the K Basins.** The sludge will be separated into transuranic (TRU) and non-TRU fractions as it is removed to the extent practicable.

- The description in this ROD is based on the assumption that the majority of the sludge will be TRU and will be transferred to a permitted storage and treatment facility in the 200 Area. The interim remedial action will be completed upon receipt at the sludge storage and treatment facility, although it is expected that the TRU sludge will then be managed with other Hanford TRU waste and ultimately disposed off-site at the Waste Isolation Pilot Plant.
- Non-TRU sludge will be transported to the Environmental Restoration Disposal Facility (ERDF) located in the 200 Area, treated to meet the waste acceptance criteria, and disposed.

(**Treat and remove water from the K Basins.** Water treatment at the K Basins will be done using the Integrated Water Treatment System (IWTS) during operations as well as pre-treatment prior to water removal from the basins. After pre-treatment in the basins the water will be pumped into tanker trucks and transported to the Effluent Treatment Facility (ETF) in the 200 Area. The interim remedial action will be completed upon receipt at the ETF, although it is expected that water will then be further treated at the ETF and disposed at the State Approved Land Disposal Site also located in the 200 Area.

(**Remove debris from the K Basins.** The debris will be treated as needed to meet the waste acceptance criteria of the storage or disposal facility and transported to storage or disposal facilities. Treatment may occur at the K Basins, at a separate debris treatment facility, or at the storage or disposal facility. It is anticipated that most of the waste will be disposed of at the ERDF. Debris that does not meet waste acceptance criteria for ERDF will be stored in an existing permitted facility in the 200 Area. Debris storage in the 200 Area is beyond the scope of the interim remedial action.

(**Deactivate the basin.** Material removed will be disposed as debris.

(**Institutional Controls.** The DOE will maintain or implement access restrictions to prevent public access until final remedial action is completed.

Retrieval of SNF, sludge, debris, and water from the basins; basin deactivation; and treatment within the scope of this interim remedial action will be designed by the DOE. The DOE will incorporate the design into the Remedial Design Report / Remedial Action Work Plan (RDR/RAWP). Treatment, storage, and disposal facilities will be identified in the RDR/RAWP. The RDR/RAWP is subject to approval by the U.S. Environmental Protection Agency (EPA). Subsequent actions under CERCLA will remediate the basins and releases of hazardous substances to the underlying soil and groundwater and constitute the final remedy for the site.

STATUTORY DETERMINATIONS

This interim remedial action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements directly associated with this action, and is cost-effective. This interim remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, given the limited scope of the interim remedial action. This interim remedial action complies with the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume of contaminants as a principal element. Subsequent actions are planned to fully address the threats posed by this operable unit.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unrestricted use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Because this is an interim remedial action, review of this operable unit and the remedy will be ongoing as the DOE, EPA, and Washington State Department of Ecology continue to develop and implement final remedial alternatives for the operable unit and the 100 Area National Priority List (NPL) site.

The preamble to the NCP indicates that when non-contiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows waste transfer between such non-contiguous facilities without having to obtain a permit. The 100-K Area and the 200 Area are treated as one site for response purposes for this interim remedial action. This is consistent with all previous Hanford 100 Area RODs which required transfer of waste to the 200 Area.

DATA CERTIFICATION CHECKLIST

The following information is included in the *Decision Summary* section of this ROD. Additional information can be found in the Administrative Record file for this site.

(Chemicals of concern (COCs) and their respective concentrations (see Section VII)
(Baseline risk represented by the COCs (see Section VII)
(Cleanup levels established for COCs and the basis for the levels is beyond the scope of this interim remedial action (see Section IV and VI)
(Current and future land and ground-water use assumptions used in the baseline risk assessment and ROD are not included in this ROD because they are beyond the scope of this interim remedial action (see Section VI)
(Land and groundwater use that will be available at the site as a result of the Selected Remedy are not included in this ROD because they are beyond the scope of this interim remedial action (see Sections IV and VI)
(Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see Section 10.7 and tables 9-1, and 10-1 for cost information. See Section 10.5 for schedule)
(Decisive factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) (see Section X and the EIS discussion in Section II)

Signature sheet for the Record of Decision for the USDOE Hanford 100- KR-2 Operable Unit K Basins Interim Remedial Action between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

9/22/99

Keith Klein
Manager, Richland Operations Office
United States Department of Energy

Date

Signature sheet for the Record of Decision for the USDOE Hanford 100-KR-2 Operable Unit K Basins Interim Remedial Action between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Chuck Clarke 9/17/99

Chuck Clarke
Regional Administrator, Region 10
United States Environmental Protection Agency

Date

Signature sheet for the Record of Decision for the USDOE Hanford 100-KR-2 Operable Unit K Basins Interim Remedial Action between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Michael A. Wilson 9/20/99

Michael Wilson Date

Program Manager, Nuclear and Mixed Waste Program

Washington State Department of Ecology

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RESPONSIVENESS SUMMARY

ACRONYMS

ARAR	applicable or relevant and appropriate requirements
CSB	canister storage building
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
COCs	contaminants of concern
CVD	cold vacuum drying
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
IWTS	Integrated Water Treatment System
MCO	Multi-Canister Overpack
NCP	*National Oil and Hazardous Substances Pollution Contingency Plan*
NEPA	*National Environmental Policy Act*
NPL	national priority list
NRC	Nuclear Regulatory Commission
O&M	operations and maintenance
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
RDR/RAWP	Remedial Design Report/Remedial Action Work Plan
ROD	record of decision
SARA	*Superfund Amendments and Reauthorization Act of 1986*
SNF	Spent Nuclear Fuel
Tri-Parties	U.S. Department of Energy, Richland Operations Office; U.S. Environmental Protection Agency; and Washington State Department of Ecology
TRU	transuranic
TBC	to be considered
TSCA	*Toxics Substances Control Act of 1976*
USC	United States Code
WAC	Washington Administrative Code
WIPP	Waste Isolation Pilot Plant

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

This Record of Decision (ROD) addresses the contents of the K Basins, which are located at the Hanford Site. The Hanford Site is a 586 square mile Federal facility operated by the U.S. Department of Energy (DOE) near Richland, Washington (figure 2, Hanford Site map). The region includes the incorporated cities of Richland, Pasco, and Kennewick (Tri-Cities) and surrounding communities in Benton, Franklin, and Grant counties. Four areas within the Hanford Site were listed on the National Priorities List (NPL) in November 1989 under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) as amended by the *Superfund Amendments and Reauthorization Act of 1986* (SARA). The four NPL Sites are the 100 Area, 200 Area, 300 Area, and 1100 Area.

The 100 Area, which encompasses approximately 68 km^2 (26 mi^2) bordering the south shore of the Columbia River, is the site of nine retired plutonium production reactors. Two of the reactors (K-East and K-West) reside in the 100-KR-2 Operable Unit in the 100-K Area. Adjacent to each of these reactors is a spent nuclear fuel (SNF) storage basin (figure 2, 100-KR-2 Operable Unit with K Basins). The contents of those basins are addressed in this ROD.

The K Basins are currently being used to store irradiated (spent) nuclear fuel from past operations. The basins are located inside the reactor building and hold 1.3 million gallons of water each. The water provides a radiation shield, as well as a thermal sink for heat generated by the stored SNF. The SNF consists of metallic uranium clad in either a Zircaloy or aluminum jacket. The cladding on some of the SNF has been damaged, allowing contact between the irradiated uranium and the basin water. Corrosion of the damaged fuel results in transfer of radionuclides to the basin water and produces contaminated sludge. The SNF, sludge, water, and debris in the basins are described further in Section V, Site Characteristics.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Hanford Site was established during World War II as part of the "Manhattan Project" to produce plutonium for nuclear weapons. Hanford Site operations began in 1943 and continued until 1990 producing nuclear materials for the nation's defense. Past Hanford Site operations resulted in the planned and unplanned release to the environment of large quantities of radioactive and hazardous substances. More than 2,000 waste sites have resulted.

In 1988, the Hanford Site was scored using the EPA's Hazard Ranking System. As a result of the scoring, four areas within the Hanford Site were added to the NPL in November 1989 (the 100 Area, the 200 Area, the 300 Area, and the 1100 Area). Each of these areas was further divided into operable units (a grouping of individual waste units based primarily on geographic area and common waste sources). The 100 Area NPL site consists of 17 source operable units (comprising contaminated sources such as soils, structures, debris, and burial grounds) and five groundwater operable units. The K Basins are contained in the 100-KR-2 Operable Unit.

In anticipation of the NPL listing, DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (collectively, the Tri-Parties) entered into a Federal Facility Agreement and Consent Order in May 1989 known as the Tri-Party Agreement. This agreement established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at the Hanford Site. The agreement also addresses *Resource Conservation and Recovery Act* (RCRA) compliance and permitting.

The K-East and K-West Reactors operated from 1955 until 1970 and 1971, respectively. Most of the SNF in the K Basins was removed at the time of the shutdown. The K Basins were reused to store SNF from the N Reactor beginning in 1975 for K East and 1981 for K West and continues today. The K Basins presently contain SNF, contaminated sludge, water, and debris. Past leaks from the basins have contaminated the underlying soil and groundwater. The basins' integrity continues to degrade with age as does the condition of the SNF which increases risk to the environment and poses potential safety issues.

In the early 1990s, the DOE determined that action was necessary to mitigate further releases from the basins and SNF degradation. The DOE used the *National Environmental Policy Act of 1969* (NEPA) process to evaluate alternatives for action and issued an environmental impact statement (EIS) in 1995. The alternatives focused on managing the SNF, with secondary discussions of the sludge, water, and debris. The alternative selected in the resulting 1996 NEPA ROD was to remove the SNF from the basins, stabilize it at a facility located in the 100-K Area, and place it in interim storage in the 200 Area in central Hanford. The selected alternative also included removal and pretreatment of the water and transfer to an existing treatment facility in the 200 Area; removal of the sludge and transfer to either a tank or solid waste management facilities in the 200 Area; removal of the debris and transfer to solid waste management facilities in the 200 Area; and preparation of the basins for deactivation and turnover to the decontamination and decommissioning program.

When DOE's schedule for implementing the NEPA selected remedy was delayed, certain activities that were covered in the K Basins EIS directly related to mitigating the potential to release hazardous substances from the basins to the environment were brought under CERCLA authority. CERCLA provided EPA the vehicle for a legally enforceable schedule under the Tri-Party Agreement and also allows for cost-effective disposal of waste to the Environmental Restoration Disposal Facility (ERDF) that can only accept Hanford Site CERCLA waste.

The purpose of the K Basins CERCLA interim remedial action is to mitigate the potential to release hazardous substances from the K Basins. Within this scope is removal of the SNF, sludge, water, and debris from the basins, pretreatment of the water, and basin deactivation (see figure 1). Other activities covered in the K Basins EIS and ROD, namely the stabilization and interim storage of the SNF, are not addressed by this interim remedial action. Stabilization and interim storage of the SNF continue to be conducted under the authority of the *Atomic Energy Act of 1954* as analyzed via the NEPA process. The SNF Cold Vaccum Drying (CVD) and Canister Storage Building (CSB) facilities are being constructed to be equivalent to current Nuclear Regulatory Commission (NRC) standards and operating procedures being developed such that SNF management beyond the scope of this CERCLA action does not present an endangerment to public health, welfare, or the environment. The NEPA analysis of environmental impacts associated with removing SNF, sludge, water, and debris from the K Basins and pretreating the water were used in the CERCLA process. Sludge treatment processes were not analyzed in the NEPA process, but were analyzed in the CERCLA feasibility study.

Figure 1. Paths for Management of Waste Stored in the K Basins.

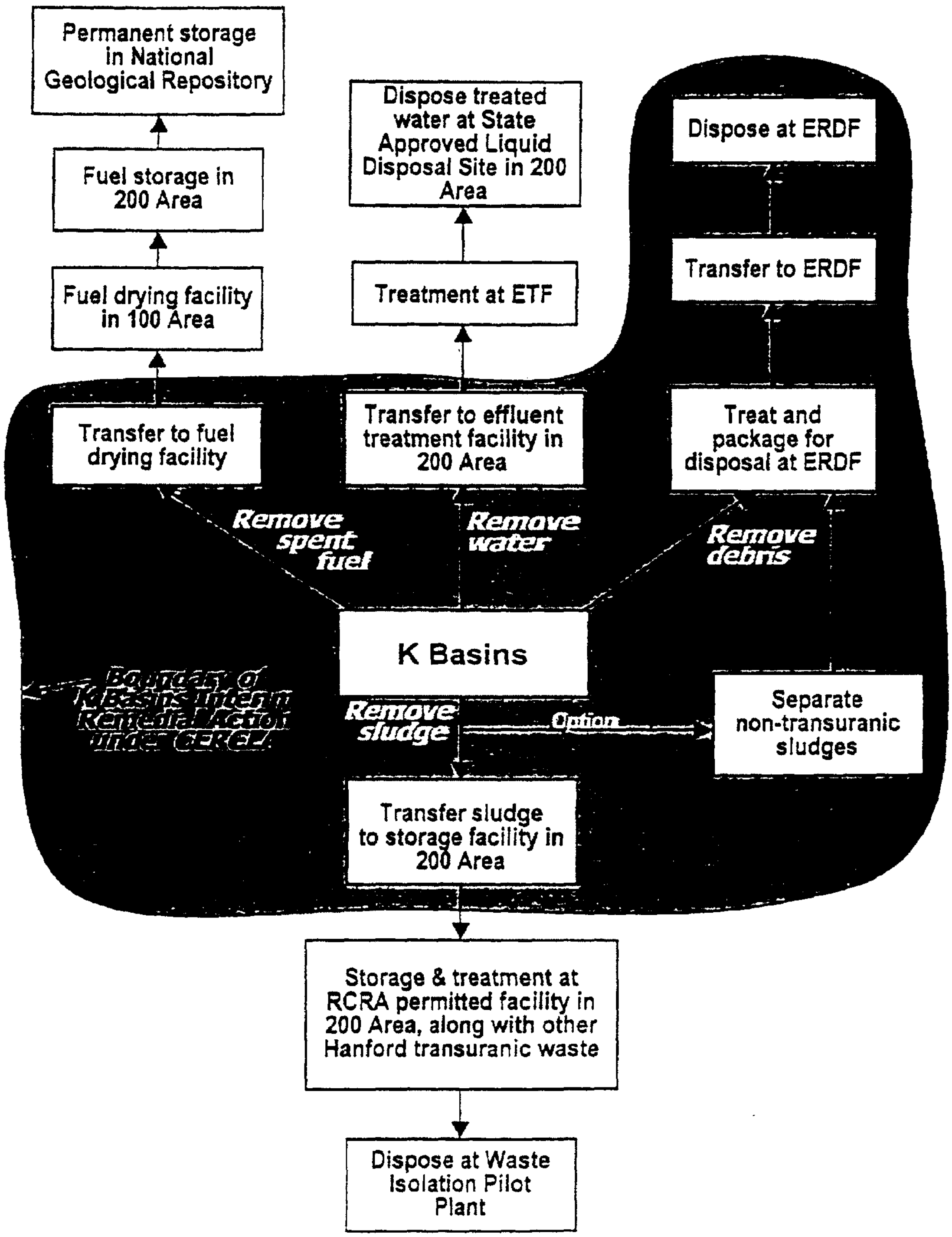


Figure 2. Hanford Site.

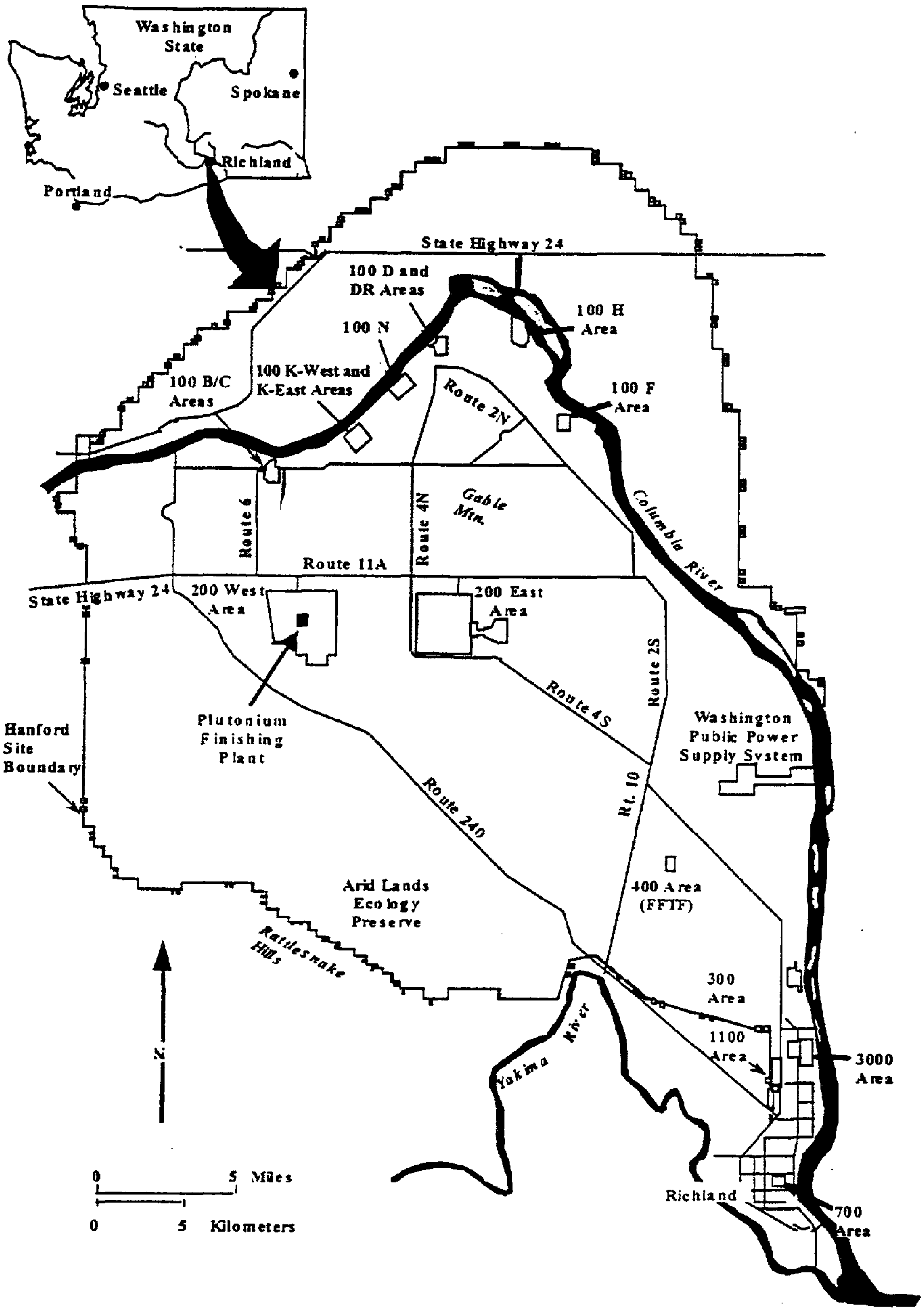
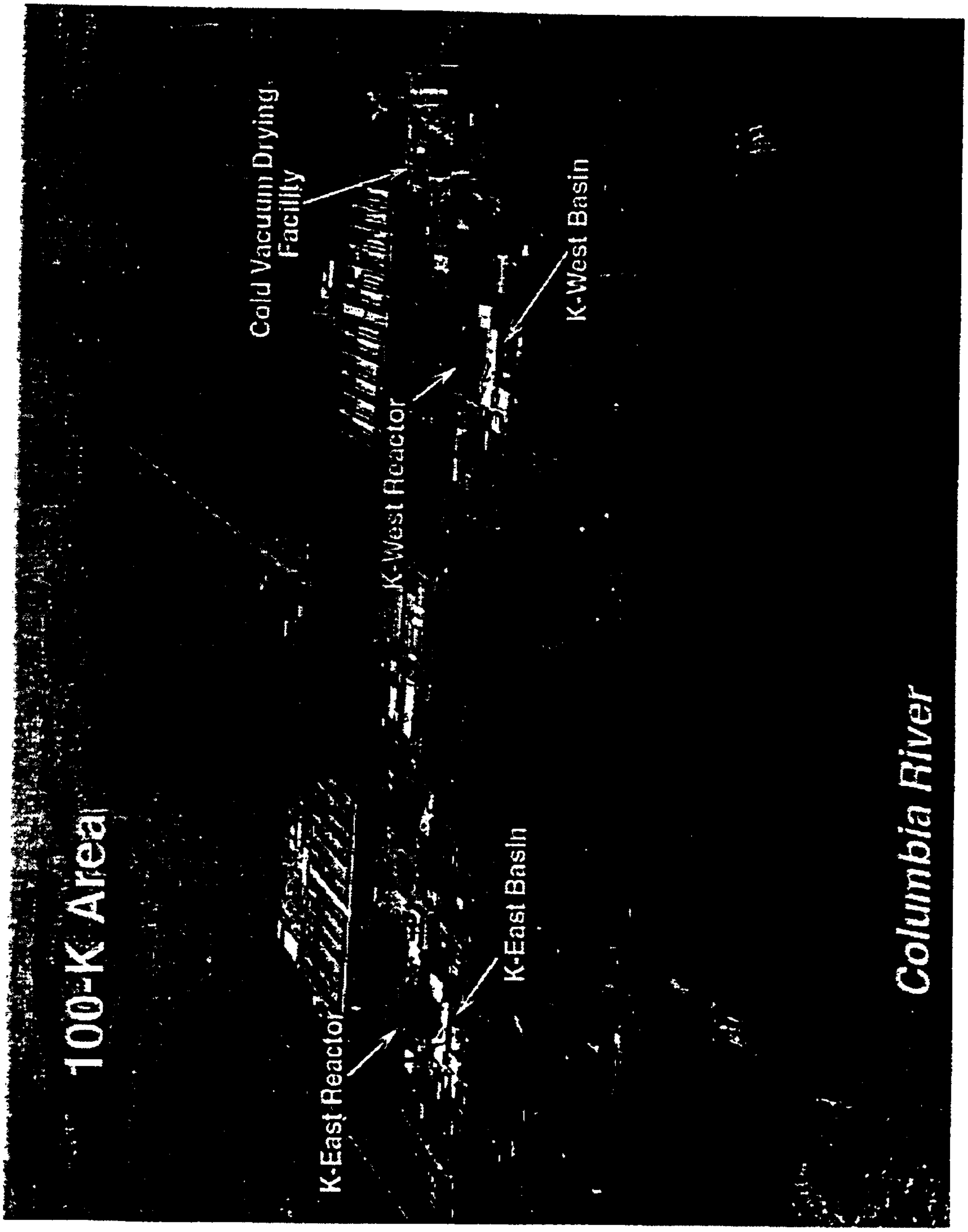


Figure 3. 100-K Area with K Basins.



III. COMMUNITY PARTICIPATION

The K Basins project has had very high visibility for half a decade with frequent dialogue with involved community stakeholders and Native American Tribes. Included in that community participation were four notable formal public comment opportunities: as part of DOE's NEPA efforts in 1995, around July 1997 and again in October 1998 on cleanup milestones for the Tri-Party Agreement, and then for the Proposed Plan leading to this ROD.

The Tri-Parties developed a Community Relations Plan in April 1990 as part of the overall Hanford Site restoration. The Plan was designed to promote public awareness of the investigations and public involvement in the decision-making process. The community relations plan was updated in 1993 and again in 1996 to enhance public involvement.

A fact sheet supporting the Feasibility Study and Proposed Plan public comment was mailed to over 1200 people who have identified themselves as "highly interested" in the Hanford cleanup. This mailing list included the members of the Hanford Advisory Board (a citizen / stakeholder site-specific advisory board), Native American Tribes who have reserved treaty rights to Hanford-related resources, and Natural Resource Trustees. A calendar of Hanford events that listed this public comment period, public meeting, and point of contact was mailed to over 3700 people who have identified themselves as "interested" in the Hanford cleanup. The Proposed Plan and Focused Feasibility Study Document were available to the public in both the Administrative Record and the Information Repositories maintained at the locations listed below. The documents were posted on the Internet with the Internet address advertised in the fact sheet and newspaper ad. The newspaper ad was run twice in the Tri-City Herald newspaper, on the Sunday before public comment started and again on the Sunday before the public meeting. These documents underwent a 45-day public comment period from May 15, 1999 to June 28, 1999 and a public meeting was held in Richland, Washington on June 10, 1999. Focus sheets and Proposed Plans were distributed upon request.

ADMINISTRATIVE RECORD

U.S. Department of Energy
Richland Field Office
Administrative Record Center
740 Stevens Center
Richland, Washington 99352

INFORMATION REPOSITORIES

Universities of Washington
Suzzallo Library
Government Publications Room
Mail Stop FM-25
Seattle, Washington 98195

Gonzaga University
Foley Center
E. 502 Boone
Spokane, Washington 99258

Portland State University
Branford Price Millar Library
Science and Engineering Floor
SW Harrison and Park
P.O. Box 1151
Portland, Oregon 97207

DOE Richland Public Reading Room
Washington State University, Tri-Cities
100 Sprout Road, Room 130
Richland, Washington 99352

Six individuals provided public comments. These comments and EPA responses are included in the Responsiveness Summary, which is attached to this ROD. This decision document presents the selected interim remedial action for the fuel, sludge, water, debris, and deactivation of the basins in order to mitigate the potential to release hazardous substances from the basins. The selected interim remedy is chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan (NCP). The decision for these operable units is based on the Administrative Record.

IV. SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

The goal of the CERCLA interim remedial action is to mitigate the potential to release hazardous substances from the K Basins. This will be achieved by removing SNF, sludge, water, and debris, and conducting contaminant removal during deactivation of the basins. The scope of the K Basins CERCLA interim remedial action consists of the following:

- Remove SNF, sludge, debris, and water from the basins.
- Transfer SNF to the 100-K Area Cold Vacuum Drying facility.
- Transfer sludge to the 200 Area sludge treatment and storage facility or the ERDF.
- Treat non-TRU sludge to meet ERDF waste acceptance criteria and dispose at ERDF.
- Treat water with the Integrated Water Treatment System (IWTS) and transfer it to the Effluent Treatment Facility(ETF).

Treat debris, and transfer to disposal or storage facilities in the 200 Area.
Deactivate the basins. Removed material will be managed as debris.

The scope of this CERCLA interim remedial action does <u>not</u> include the following:

- Stabilization, interim storage, or final disposition of the SNF
- Treatment of sludge for interim storage at the 200 Area sludge treatment and storage facility
- Interim storage or final disposition of the sludge, water, or debris (except for any disposal at the ERDF which is part of this CERCLA interim remedial action)
- Final decontamination and decommissioning of the basin structures or remediation of underlying soil and groundwater.

Stabilization and interim storage of the SNF continue to be conducted under the authority of the *Atomic Energy Act of 1954* as analyzed by DOE via the NEPA process. Treatment, storage, or disposal facilities in the 200 Area for sludge, water, or debris are all regulated by existing permits or RODs from EPA and/or the State of Washington. Operation of those facilities are beyond the scope, but will receive waste from this interim remedial action.

The contents of the K Basins must be removed before it will be practical to remediate the basin structures or underlying soil. The basin structure and underlying soil are included as waste sites 100-K-42 (K-East Basin) and 100-K-43 (K-West Basin) in the 100 Area Remaining Sites Interim Action ROD signed July 1999. The selected remedy for these waste sites is excavation, treatment as necessary, and disposal at the ERDF according to cleanup levels set forth in the Remaining Sites ROD. The cleanup levels in the Remaining Sites ROD were established to support unrestricted human surface use and protection of the groundwater and Columbia River. Remediation of contamination in groundwater is addressed through 100-KR-4 Operable Unit decision documents: For example, the April 1996 100-KR-4 interim remedial action ROD addresses a chromium plume originating from liquid discharge to the nearby 116-K-2 liquid waste trench.

Generally, the Hanford 100 Area is being cleaned up to Washington State's Model Toxics Control Act standards for non-radionuclides for human residential exposure. Radionuclide contaminants are being cleaned up to 15 mrem/year above background radiation dose also based on a residential exposure. Waste is being removed from the 100 Area, which is adjacent to the Columbia River, to the 200 Area in central Hanford. The 200 Area is intended for long-term storage and disposal. Some of the waste sent to the 200 Area, such as the SNF and transuranic (TRU) sludge is ultimately expected to be sent off-site. This CERCLA interim remedial action is consistent with the waste management approach used in other CERCLA decision documents.

This is an interim remedial action ROD. Therefore review of this operable unit and the remedy will be ongoing as the Tri-Parties continue to develop and implement final remedial alternatives for the operable units and the 100 Area NPL site. Because this remedy will result in hazardous substances remaining on-site above health-based levels, EPA will conduct a review within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

V. SITE CHARACTERISTICS

The Hanford Site occupies 586 square miles within the semiarid Pasco Basin of the Columbia Plateau in southeastern Washington. The Columbia River flows through the northern part of Hanford and, turning south, forms the eastern boundary of the site. The river is bounded by wide expanses of uplands. These uplands contained abundant natural resources, including native plants, wildlife, and geologic resources. In addition, the Pasco Basin is where the Snake River and the Yakima River join the Columbia River, providing a wealth of riparian areas as well as an excellent means of transportation throughout the semiarid inland northwest. These rivers contained enormous fisheries.

The entry of the U.S. into World War II and the decision to develop an atomic bomb led to a search for a suitable place to locate plutonium production and purification facilities. The U.S. Army Corps of Engineers selected the site near the towns of White Bluffs and Hanford because of the remote location, good climate, and, most important, the abundant supply of hydroelectric power and clean water from the Columbia River. The selection was made in early 1943. Plutonium for nuclear weapons were produced in nuclear reactors built along the Columbia River at the Hanford Site. Two of the nine total reactors are the K-East and K-West reactors which operated from 1955 to 1970 and 1971, respectively. Adjacent to each of these reactors are SNF storage basins (i.e. the K-East and K-West Basins).

The K-East and K-West Basins are currently being used to store irradiated nuclear fuel elements from past operations. The basins are located inside the reactor building and hold 1.3 million gallons of water in each basin. The water provides a radiation shield, as well as a thermal sink for heat generated by the stored SNF. The SNIF consists of uranium clad in a metallic jacket. The cladding on some of the SNF has been damaged, allowing contact between the irradiated uranium and the basin water. Corrosion of the damaged fuel results in transfer of radionuclides to the basin water and produces contaminated sludge. The materials and wastes that will be addressed by the interim remedial action consist of the SNF, sludge, water, and debris that are further described in Sections 5.1 through 5.4

5.1 Spent Nuclear Fuel

Approximately 2,100 metric tons (2,300 tons) of SNF are stored in the K-East and K-West Basins. Most of the fuel is from the past operation of the N Reactor. The SNF consists primarily of metallic uranium, but also includes plutonium and radioactive fission and activation products. The fuel is encased in either a Zircaloy or aluminum cladding.

The K-East Basin contains about 1,150 metric tons (1,260 tons) of SNF, stored underwater in 3,673 open-top canisters. Most of this SNF has been stored for varying lengths of time ranging from 9 to 25 years. Much of the SNF stored in the K-East Basin is damaged, and it has been estimated that about one percent of the original mass of the fuel has corroded because of cracks and breaks in the cladding which has contributed to the volume of radioactive sludge in that basin.

The remainder of SNF, approximately 953 metric tons (1,050 tons), is stored underwater in the K-West Basin in 3,817 closed canisters. Because the SNF was placed in closed containers before storage, corrosion products were retained within the canisters and the volume of sludge accumulated on the floor of the K-West Basin is much smaller than in the K-East Basin. As discussed in Section VI, removal of the SNF from the K Basins is included within the scope of this interim remedial action, although stabilization, interim storage and final disposition are not.

5.2 Contaminated Sludge

The K Basins contain a total of about 1800 cubic feet of highly-radioactive sludge that resides on the basin floors, in the basin pits, and in the SNF storage canisters. Sludge will also be generated as the SNF is washed prior to removing it from the basins. The composition of the sludge is complex and varies depending on the location and the basin. Sludge consists of SNF corrosion products (including metallic uranium, uranium hydrides and oxides, plutonium, fission and activation products, and aluminum and zirconium compounds from the cladding), metal oxides from corrosion of basin equipment including aluminum SNF canisters, ion exchange media from the water treatment system, concrete grit from the basin walls, sand, and dirt.

Sludge components are not uniformly distributed throughout the basin sludge. Large quantities of SNF corrosion products in the floor and pit sludge are a result of the open tops, and in some cases open-screened bottoms, of the SNF storage canisters in the K-East Basin. Sludge in the K-East Basin canisters themselves consists primarily of fuel corrosion products.

There is very little sludge on the floor of the K-West Basin, and what there is appears to consist primarily of dust and sediment. The floor sludge is not expected to contain significant amounts of fuel corrosion products because the canisters in the K-West Basin have closed tops and bottoms, but there are still low levels of radioactivity in the floor sludge. Only one of the areas in the K-West Basin (the North Loadout Pit) contains a significant amount of sludge and this is likely to consist of a mix of sand and fuel corrosion products. Because the canisters in the K-West Basin are completely closed, any sludge in them is expected to derive almost exclusively from SNF and consist of fuel corrosion products.

Based on sludge characterization data, the sludge designates as a TRU waste (a radioactive waste that contains greater than 100 nanocuries per gram of transuranic radionuclides with a half life greater than 20 years) under the *Atomic Energy Act*. It might also be a dangerous waste under the *Resource Conservation and Recovery Act* (RCRA) and the state *Hazardous Waste Management Act* based on total concentrations of cadmium, chromium, and lead. Finally, the sludge is regulated as a PCB (polychlorinated biphenyl) remediation waste under the *Toxics Substance Control Act* due to small amounts of incidental contamination with PCBs.

5.2.1 Sludge Management Concerns

Concerns that were important in evaluating remedial alternatives for the sludge included the following:

w The surface dose for an unshielded container of sludge is many times higher than the 200-mrem/hr limit for contact-handled waste. The contact dose associated with floor and pit sludge could be as high as 128,000 mrem/hr and the contact dose rate associated with canister and wash sludge could be as high as 1.75 million mrem/hr. Because of this, it is anticipated that containers of sludge will need to be managed as a remote-handled waste unless special overpacking is provided.

- The high concentrations of fissile materials (uranium and plutonium) require careful evaluation of criticality control for all activities involving the sludge.
- Metal fines and metal hydrides in the sludge (e.g., uranium, uranium hydride, and zirconium) are potentially pyrophoric, reactive, and capable of generating flammable gas.

5.3 Contaminated Water

Each basin contains approximately 1.3 million gallons of water that is used to shield and cool the SNF. The water is currently maintained in a closed-loop system and is continually recycled from the basins, circulated through existing treatment systems, then returned to the basins. This treatment is necessary to maintain adequate water quality (e.g., reduce cloudiness) and reduce concentrations of soluble radionuclides. Based on current chemical characterization data, the water is not regulated as a dangerous waste or as a PCB remediation waste. As outlined in Section IV, the interim remedial action is limited to pretreatment of the water using the in-basin treatment system and transport to the ETF.

5.4 Contaminated Debris

Basin debris comprises a wide spectrum of materials. These include approximately 7,500 fuel canisters, old basin equipment and piping, hand tools, fuel canister storage racks, construction materials from the basins, equipment used for basin clean out, components of the basin water pretreatment system, and waste generated during deactivation of the basins such as contaminated equipment and structural materials.

Most of the debris is expected to designate as low-level radioactive waste under the *Atomic Energy Act*. Some of the debris may designate as mixed (radioactive and dangerous) waste, TRU waste, or mixed TRU waste, depending on the chemical composition of the debris itself and residual sludge attached to the debris. The debris is also regulated as a PCB remediation waste where it has contacted sludge.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Current land use in the 100 Area of Hanford includes facilities support, environmental cleanup, and waste management. Facilities support activities include operations such as water treatment and maintenance of the reactor buildings. Environmental cleanup activities include excavation of contaminated soil, groundwater extraction and treatment, and building decontamination and decommissioning. Waste management activities include surveillance and maintenance of former disposal waste sites now know as "past-practice sites" located throughout the 100 Area as well as management of wastes generated during other 100 Area activities. There are also substantial tracts of undeveloped land located throughout the 100 Area that comprise approximately 90 percent of the land area within the 100 Area. These areas have been disturbed very little and contain minimal infrastructure.

Future land use of the 100 Area has not been determined. 100 Area waste sites are being remediated so as not to preclude any future surface use. Groundwater is currently used for monitoring contaminant plumes and is subject of a number of CERCLA cleanup actions. The groundwater meets state technical standards for a potential drinking water source (pumpability and total dissolved solids), but because of contamination from Hanford Site operations, it would not be useable for any purpose in its present condition. Future use of the groundwater has not been determined and depends in large part on cleanup capabilities and future land use.

VII. SUMMARY OF SITE RISKS

The hazardous substances addressed by this interim remedial action are derived from the SNF and include the SNF, sludge, debris, and water present in the K-East and K-West Basins and contamination removed as part of deactivation. These items were described in Section V. Basin leaks have contaminated underlying soil and groundwater which contributes to the risk from the basins and hence the need for this interim remedial action. This interim remedial action addresses the contents of the basins to mitigate the potential for future releases. The two basin structures and underlying contaminated soil have been addressed in the July 1999 Remaining Sites Interim Remedial Action ROD, and groundwater is being addressed in 100-KR-4 Operable Unit decision documents as described in Section IV.

The contaminants of concern in the K Basins that drive the risk evaluation are primarily radionuclides. The basins contain about 55,000,000 curies of radioactivity. Concentrations of radionuclides in the K Basins sludge and SNF are such that unshielded exposure would result in a significant radiation dose. Potential risks to human health and the environment associated with current conditions at the K Basins include the following:

Potential for releases. The basins have leaked millions of gallons of contaminated water to the groundwater that discharges to the nearby Columbia River. Monitoring wells between the basins and the Columbia River have documented the radioactive plume. Tritium has been measured over a hundred times the drinking water standard of 20,000 pCi/L. Strontium-90 has been measured over a thousand times the drinking water standard of 8 pCi/L. Any substantial release of water or sludge from the basins causes further degradation of the groundwater. Deficiencies at both basins continue to present a potential for future leaks.

Fuel degradation. The SNF was not designed for long-term storage in water. However, some of the SNF has been stored underwater in the basins for more than 20 years. In the K-East Basin, damaged fuel cladding surrounding the metallic uranium fuel elements has allowed water to corrode the fuel. The corrosion further damages the fuel, releasing radioactive material to the water and contributing to the buildup of a thick layer of sludge on the basin floor.

Basin Design and seismic adequacy. As the basins continue to age there is a potential for further loss of structural integrity and further releases from the basins to the environment. The K Basins were designed to consensus codes and standards of the early 1950s. The K Basins have currently exceeded their 20-year design life by more than 20 years. Upgrades to equipment and systems are required to ensure occupational safety and environmental protection. The basins do not provide confinement of radioactive materials released to the air, nor liquid released in the event of a leak. In addition, the basins were not designed to modem seismic criteria. Basin failure during a seismic event could allow large volumes of water to leak to the soil. Failure to maintain a sufficient amount of water to cool the SNF and sludge and provide shielding for workers would allow the SNF and sludge to dry and heat, resulting in an airborne release of radionuclides.

Location. The K Basins are located approximately 430 m (1,400 ft) from the Columbia River. The proximity of the basins to the river increases the likelihood that the river would become contaminated as a result of a leak from the basins and migration to the soil and groundwater.

Occupational exposure. The lack of confinement for the corroding fuel in the K-East Basin has resulted in higher than desired radiation exposure to workers during routine and non-routine activities. Dose reduction activities are underway at the basin. These activities are designed to improve overall occupational safety at the K Basins but are not expected to achieve current standards for occupational exposure for prolonged storage at the K Basins.

Risk Summary A major natural event (e.g., seismic event) could release most or all of the basin water and potentially some of the basin sludge to the subsurface environment, where it could leach to groundwater and be transported to the Columbia River. The potential risk to the environment and human health combined with the continued occupational risk to workers justifies this interim remedial action. The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances from the K Basins into the environment.

VIII. REMEDIATION OBJECTIVES

The overall purpose of this interim remedial action is to mitigate the potential to release hazardous substances from the K Basins by removing the SNF, debris, sludge, and water from the K Basins, deactivate the basins, and transfer the SNF and waste to facilities that will manage them in a manner that protects human health and the environment. The scope of this interim remedial action does not include final disposition of the basin structures themselves or remediation of the underlying soil or groundwater. Disposition of the basins, contaminated soil, and groundwater has been or will be addressed under other CERCLA actions as described in Section IV. This interim remedial action only addresses the immediate risks associated with the contaminants in the basins. Enforceable Tri-Party Agreement milestones have been established to accomplish this interim remedial action in a safe and expeditious manner. Final cleanup levels appropriate to future use scenarios are beyond the scope of this interim remedial action, and have been or will be set in other CERCLA decision documents.

The Remedial Action Objectives are as follows:

- Reduce the potential for future releases of hazardous substances from the K Basins to the environment.
  - Remove hazardous substances from the K Basins near the Columbia River in a safe and timely manner.
  - Provide for safe treatment, storage, and final disposal of the SNF, sludge, water, and debris removed from the K Basins.
  - Prevent further deterioration of the SNF.
- Reduce occupational radiation exposure to workers at the basins.
- Address the sludge management concerns identified in Section 5.2.1.
- Develop the most cost effective site-wide approach, consistent with the CERCLA nine criteria, for treatment, storage, and disposal of sludge.
- Treat, store, and/or dispose of sludge soon after removal.

IX. DESCRIPTION OF ALTERNATIVES

The K Basin project had undergone a NEPA analysis of alternatives (see Section II) leading to a definitive decision for the SNF, water, debris, and deactivation. Therefore, the focus of the feasibility study was sludge treatment. Five remedial action alternatives were included in the focused feasibility study and proposed plan. Their names derive from the type of treatment of the sludge. Except for no action, all the alternatives are identical with respect to SNF, water, debris, and deactivation.

The remedial alternatives for the sludge consist of the following:

Alternative 1: No Action
Alternative 2: Chemical Treatment
Alternative 3: Physical Treatment
Alternative 4: Thermal Treatment
Alternative 5: Solidification

9.1 Overview of Alternatives Development for Sludge

The sludge treatment alternatives were developed with the intent of treating the K Basins sludge as a unique waste stream before combining it with other Hanford waste for final treatment and disposal. The feasibility study showed there were implementability issues and high costs (see table 9-1) for all of the treatment alternatives. Treatment of K Basins sludge as a unique waste form would not take full advantage of the economies of scale possible by combining with other large capacity waste treatment processes under development at Hanford. Therefore, this ROD is not selecting any of the sludge treatment alternatives for large-scale implementation for K Basins sludge.

Just prior to public comment, an additional alternative analysis supported doing the minimal treatment of sludge necessary to support storage in existing permitted regulated facilities in the 200 Area. The K Basins sludge would then be treated and disposed as part of the much larger TRU waste stream at Hanford that is addressed under milestone M-91 in the Tri-Party Agreement. Most of the sludge is not expected to need treatment prior to storage in the 200 Area. Any treatment that would be needed prior to storage would be done as a permitted action at the storage facility.

A small portion of the sludge that is non-TRU may be isolated from the rest of the sludge and undergo treatment by one of more of these alternatives to meet ERDF waste acceptance criteria. The original sludge treatment alternatives are described briefly in the following section as they may be applied in a small scale to a small portion of the sludge if needed to meet the waste acceptance criteria of ERDF.

9.1.1 Alternative 1: No Action

The No Action Alternative represents a situation where there would be continued storage of the SNF, sludge, debris, and water in the K Basins for up to 40 years with no modifications except for routine maintenance, monitoring, and ongoing safety upgrades. There would be no major upgrades to significantly enhance storage capabilities.

9.1.2 Alternative 2: Chemical Treatment

Acid would be used to dissolve the sludge to reduce the size of sludge particles (a part of criticality control) and make metals less reactive. Iron or depleted uranium that absorbs radioactive energy would be added to the acid solution to prevent criticality. Chemicals would be added to neutralize and adjust the solution. Treated sludge would be stored in an existing 200 Area storage facility.

9.1.3 Alternative 3: Physical Treatment

Two types of physical treatment were combined for this alternative; grinding/milling and physical separation based on particle size. A high-energy mill would be used to grind the sludge to reduce the size of sludge particles (a part of criticality control) and make metals less reactive. Large particles would be separated and recycled to the grinder. Iron or depleted uranium would be added to the solution after grinding to prevent criticality. Chemicals would be added to adjust the solution. Treated sludge would be stored in the 200 Area sludge storage facility.

9.1.4 Alternative 4: Thermal Treatment

Two thermal treatment options evaluated were vitrification and calcination. The sludge would be separated into three streams as it was removed from the basins: small particles, large particles, and organic resin beads. The small particles would be vitrified or calcined. The large particles would be dissolved in acid, then vitrified or calcined. The glass would be stored in the 200 Area of the Hanford Site and eventually shipped offsite to the national geologic repository. Calcined waste would be packaged and stored in the 200 Area of the Hanford Site and eventually shipped offsite to the Waste Isolation Pilot Plant (WIPP). The thermal process would be designed so that the treated waste would meet the requirements for offsite disposal at a permitted facility. (Interim storage and disposal of the treated sludge are not part of this interim remedial action.) During sludge treatment, insoluble solids (such as zirconium) would be separated from the sludge. The organic resin beads and insoluble solids would contain radionuclides and some of the PCBs. They would be treated as appropriate and disposed at the ERDF or at the Waste Isolation Pilot Plant in New Mexico.

9.1.5 Alternative 5: Solidification

The sludge would be separated into three streams as it is removed from the basins: organic resin beads, small particles, and large particles. The sludge containing small particles would be oxidized in hot water and the sludge containing large particles would be oxidized in small furnaces. The organic resin beads and oxidized sludge would be combined and solidified using materials such as Portland cement. The solidification process would be designed to meet final disposal requirements.

9.2 COMMON ELEMENTS

This section describes management of the SNF, water, and debris, and deactivation that is the same in each of the action alternatives. Note that sludge management, which was different among the alternatives, was addressed in section 9.1.

9.2.1 Spent Nuclear Fuel Management

SNF will be removed from the basins, dried, and placed into dry storage. Drying will be done at the CVD facility in the 100-K Area, and dry storage will be at the CSB in the 200 Area. Drying at the CVD facility and interim storage at the CSB are not part of this CERCLA interim remedial action. The cold vacuum drying process and interim storage continue to be authorized under the *Atomic Energy Act* as evaluated under NEPA. The specific activities conducted under the authority of this CERCLA interim remedial action are as follows:

(The SNF will be agitated to loosen and remove sludge and corrosion product; the sludge and corrosion product will remain in the basin to be consolidated with other sludge.
(The SNF will be placed into fuel baskets, and the fuel baskets will be placed inside multi-canister overpacks (MCOs).
(The MCOs will be closed and transferred to the CVD for drying. The CVD has been constructed in the 100-K Area near the K Basins.
(Liquid drained from the MCOs at the CVD and during further processing will be returned to the K Basins for recycling, or transferred to the ETF.

The SNF retrieval, washing, and packaging activities at the basins could potentially generate emissions such as airborne particulate. These activities will be conducted under water to control the generation of airborne particulate.

The CVD is an appropriate facility for drying the SNF. The CVD is being designed and constructed to achieve nuclear safety equivalence comparable to Nuclear Regulatory Commission-licensed facilities. The use of standards consistent with Nuclear Regulatory Commission requirements provides a high level of safety and environmental protection.

9.2.2 Water Management

The K Basins together contain about 9.8 million L (2.6 million gal) of contaminated water. Under all the action alternatives the water will be treated in the basins with the IWTS, removed and transferred to the ETF in the 200 Area for further treatment, then disposed at the State-Approved Land Disposal Site in the 200-Area. The activities that are part of this CERCLA interim remedial action are in-basin treatment, removal, and transfer to the 200 Area. Treatment at ETF and disposal at the State-Approved Land Disposal Site are not part of this CERCLA interim remedial action.

9.2.3 Debris Management

Debris is defined as any solid waste resulting from this CERCLA interim remedial action, excluding SNF, sludge, and wastewater. Debris includes items located both above and below the water in the basins, wastes generated from operation of the water and sludge treatment systems, and wastes generated during basin deactivation. Debris may also be generated during deactivation of sludge treatment facility(ies) or equipment done as part of this CERCLA interim remedial action.

Under all the action alternatives the debris will be removed from the K Basins. Debris will be treated as necessary to meet the waste acceptance criteria for disposal at ERDF. If debris cannot be treated to ERDF waste acceptance criteria, then the debris will be transferred to an existing permitted waste management facility appropriate for the designation. When the debris is received at the storage or disposal facility, further waste management is beyond the scope of this interim remedial action.

9.2.4 Basin Deactivation

Deactivation will remove additional hazardous materials and place the basins into a condition such that they can be maintained safely with minimal surveillance and maintenance until remediation of the basin structure and releases to the underlying soil are performed. End point criteria for deactivation will be included in the Remedial Design Report / Remedial Action Work Plan (RDR/RAWP).

Table 9- 1. Alternatives Cost From Feasibility Study

	CERCLA (1)	Sludge (2)	Total (3)
No Action	Not Evaluated	Not Evaluated	Not Evaluated
Chemical Treatment	$689 M	$116-126 M	$805-815 M
Physical Treatment	$689 M	$98 M	$787 M
Thermal Treatment	$689 M	$81-122 M	$770-811 M
Solidification	$689 M	$94 M	$783 M

(1) Excludes costs associated with sludge treatment and disposal.
(2) Includes costs to design, construct, and operate a sludge treatment system; and to dispose of the treated sludge. Does not include contingency, escalation, transport to final disposal facility, project management, regulatory support, or decontamination/ decommissioning.
(3) The feasibility study included sludge treatment as a CERCLA activity. In this ROD the selected remedy does not include sludge treatment for interim storage, but does include sludge treatment for ERDF disposal.

Not Evaluated. Costs for the No Action alternative were not evaluated in the Focused Feasibility Study because the No Action alternative did not satisfy threshold criteria.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

10.1 Overall Protection of Human Health and the Environment

The No Action Alternative would fail to protect human health and the environment. The remaining alternatives would all provide overall protection of human health and the environment by removing hazardous substances from the K Basins and transferring them to facilities that are more protective, thereby reducing the potential for further degradation of the SNF and future releases from the basins.

10.2 Compliance With Applicable or Relevant and Appropriate Requirements

The No Action Alternative would not invoke new applicable or relevant appropriate requirements (ARARs) because no action would be taken; however, surveillance and maintenance activities at the K Basins would still be subject to currently applicable requirements under the No Action Alternative. The remaining alternatives would all meet ARARs.

10.3 Long-Term Effectiveness and Permanence

The No Action Alternative would not be effective or permanent because it would not address the risks at the K Basins. The remaining treatment alternatives would be equally capable of providing a high level of long-term effectiveness and permanence. The contaminants associated with the SNF, sludge, water, and debris would be removed from the K Basins and placed at more environmentally protective facilities. The basin water would be removed, thus eliminating the primary driving force for contaminant migration. After deactivation, the basins would be left in a condition where they would present minimal threat to the environment. Final remediation of the basins will be undertaken as part of a later CERCLA action.

None of the alternatives provide for immediate disposal of the bulk of the sludge, but in all cases the sludge would be transferred to facilities that are designed to provide safe interim storage and minimize the potential of an environmental release. The Thermal Treatment (Vitrification) and Solidification Alternatives might be somewhat more effective than the Chemical Treatment, Physical Treatment, and Thermal Treatment (Calcination) Alternatives because an immobilized waste form would result from treatment. Interim storage of an immobilized waste form, versus a slurry or calcined particles, would reduce the risk of releases to the environment.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

The No Action Alternative would involve no treatment. The remaining alternatives would all provide treatment of the K Basins water and sludge, and therefore, would be substantially better than the No Action Alternative. The water treatment system would be the same under all of the alternatives except No Action, so the alternatives would be equally effective in reducing the toxicity associated with contaminated water, The alternatives vary significantly in how they would perform against this criterion with respect to sludge treatment.

The Thermal Treatment (Vitrification) Alternative for sludge would perform best. Vitrification would reduce both toxicity (flammable gas generation and reactivity/pyrophoricity) and mobility significantly and reduce volume by 50 percent.

The Physical Treatment, Thermal Treatment (Calcination), and Solidification Alternatives for sludge would all perform moderately well, but not as well as vitrification. They would all reduce toxicity (flammable gas generation and reactivity/pyrophoricity) significantly, and physical treatment would reduce the potential for criticality. Solidification would perform much better than physical treatment or calcination in reducing mobility, but would perform worse in reducing volume (the volume would increase by a factor of six). Calcination would perform much better than physical treatment or solidification in reducing volume (volume would be reduced by about 75 percent) but would not reduce mobility and would generate a dispersible waste form. Physical treatment would not reduce mobility as part of this CERCLA interim remedial action and the volume of sludge requiring interim storage would increase be a factor of five.

Neither option under the Chemical Treatment Alternative for sludge would perform well against this criterion. Chemical treatment would reduce toxicity (flammable gas generation and reactivity/pyrophoricity) and the potential for a criticality. However, it would not reduce mobility as part of this CERCLA interim remedial action and both the interim and final volumes of waste produced would be several times greater than the original volume of sludge.

10.5 Short-term Effectiveness

With the exception of the No Action Alternative, the alternatives would perform equally well against the criterion of short-term effectiveness.

Risk to public and the environment. All of the treatment alternatives have the potential to impact the public and environment through airborne releases during removal and treatment activities, but none of the alternatives are expected to pose unacceptable risks. Control measures for the removal and transfer of SNF activities are well established. The potential for upset conditions may vary between alternatives depending on the type of sludge treatment, but the consequences of an upset condition would be similar because the contaminant inventory would be the same.

Risk to workers. None of the alternatives would be expected to pose unacceptable short-term risks to site workers. The primary risk to workers is the risk associated with exposure to radiation; this risk would be similar for all alternatives. Other risks would include chemical, physical, and thermal hazards. These risks would be mitigated through engineering and administrative controls.

Environmental impact. None of the alternatives would be expected to result in short-term impacts to the environment.

Schedule. All of the alternatives except the No Action Alternative were developed to meet the same schedule, specified in Milestone M-34 of the Tri-Party Agreement. Several key dates in the milestone schedule are:

(Start SNF removal from the K West Basin by November 2000.
(Start SNF removal from the K East Basin by November 2001.
(Complete SNF removal from the K East Basin by December 2003.
(Complete K East Basin sludge removal by August 2005.
(Complete K East Basin water removal by October 2006.
(Complete M-34 activities (complete removal of SNF, sludge, debris, and water) from both basins by July 2007.

10.6 Implementability

The No Action Alternative performs poorly against this criterion because it would fail to comply with the K Basins EIS and NEPA ROD, Tri-Party Agreement schedules, and commitments made to the regulators, oversight agencies, stakeholders, and public.

None of the treatment alternatives would perform well against this criterion in treating 100 percent of the sludge volume because of technical and/or administrative uncertainties. The options under the Chemical Treatment Alternative would perform better than most. Chemical treatment is a mature technology that is well established in the nuclear industry and has been tested on K Basin sludge.

All of the other treatment alternatives have significant disadvantages. Physical treatment would rely on the application of technologies that have not been used for similar waste types. There is also uncertainty about the process control, especially in grinding to very small particle sizes, and uncertainty about the time required to grind the largest particles and whether this would accommodate the Tri-Party Agreement schedule. Significant development work would be required to determine if these issues could be resolved.

Vitrification, calcination, and solidification are better than physical treatment in the near term because they are all mature technologies that are well established in the nuclear industry. However, they have not been tested using actual or simulated K Basins sludge and development work would be required. There is an additional uncertainty as to whether calcined sludge, which would be a dispersible particulate waste, could be transported to the WIPP without further processing.

There is an uncertainty associated with all of the treatment alternatives regarding whether a treatment system sized to treat the entire volume of sludge within the schedule for sludge removal identified in the Tri-Party Agreement could be located inside an existing facility. The need for a new facility would significantly affect cost and schedule, as could resolution of other uncertainties.

10.7 Cost

The alternatives do not vary significantly in overall cost of this CERCLA interim remedial action, but they do vary significantly in the costs associated with sludge (see table 9-1). Costs for the overall project are surnmarized in Table 10-1. Costs in these tables are as of March 31, 1999, rounded to the nearest $100,000 in future worth dollars. For expense dollars, the escalation rate is 2.1% per year. For capital costs, 2.5% per year is used. Note that capital is a very small portion of the remaining cost for the project. Because of the difficulty in assessing and comparing costs for disposal at the WIPP versus at the national geologic repository, there is substantial uncertainty in the long-term costs. The uncertainty in the cost estimates is plus 50% to minus 30%.

10.8 State of Washington Acceptance

The State of Washington concurs with the selected remedy which removes the contents of the K Basins and places it in protective facilities.

10.9 Community Acceptance

The community overwhelmingly supports the overall action of cleaning out the K Basins. The public comments related to sludge treatment presented in the Proposed Plan were mixed. Very few public comments were received. Some comments supported treating the sludge soon after removal from the basins. Other comments supported the preferred alternative of storing the sludge pending future treatment with other Hanford waste. A third opinion expressed in public comments was that there was insufficient information about what sludge treatment could look like to support public comment.

10.10 Summary

In summary, the No Action Alternative would fail to meet the requirements for this CERCLA interim remedial action. The other alternatives would all provide overall protection of human health and the environment, comply with ARARs, and be effective in the long term. All of the alternatives except No Action would achieve a substantial risk reduction by removing, SNF, sludge, water, and debris from the K Basins, transferring these materials to environmentally protective facilities, and deactivating the basins. In all of the treatment alternatives, the sludge would be treated to meet the acceptance criteria and all other applicable requirements at the interim storage and final disposal facilities. However, none of the treatment alternatives would perform well against all of the CERCLA criteria for the entire volume of sludge and range in sludge composition.

All of the individual treatment alternatives are very expensive because they presume extensive treatment in a standalone facility dedicated to treatment of the K Basins sludge. All of the individual treatment alternatives have significant issues related to the technical feasibility of using a particular technology or process for all of the sludge. Also EPA and DOE do not believe that any of the individual alternatives could be in place in time to treat the sludge as it is removed from the basins. This problem could be addressed by placing the sludge into interim storage with minimal treatment.

None of the individual alternatives was an appropriate choice for the sludge, and every combination of retrieval/treatment options required interim storage. Therefore the preferred alternative in the proposed plan was to rely on interim storage with minimal treatment as necessary to support interim storage. The preferred alternative relies on future treatment of the sludge to meet final disposal requirements. Since the design for sludge treatment after interim storage was not available for public comment, the proposed plan committed to a future public comment opportunity for final treatment for disposal.

Table 10- 1. K Basins Project Cost [a]

Category	CERCLA Cost ($M)[b]	Non-CERCLA Cost ($M)	Total ($M)
Project Management and Integration[c]	127.7	129.9	257.6
Basin Maintenance and Operation[d]	153.4	168.9	322.3
Basin Facility Projects	8.9	40.3	49.2
SNF Retrieval (Design/Modification/Construction)	10.8	43.2	54.0
SNF Cast Transportaion System and MCO Acquisition	65.1	43.8	109.0
SNF Retrieval (Operations)	165.2	31.2	196.3
Cold Vacuum Drying (CVD) Facility (Design/Modification/Construction)	e.	72.0	72.0
CVD Facility (Operations)	e.	44.7	44.7
Canister Storage Facility (CSB) (Design/Modification/Construction)	e.	151.7	151.7
CSB (Operations)	e.	51.4	51.4
Sludge Retrieval/Removal (Design/Modification/Construction)	12.6	7.2	19.8
Sludge Retrieval/Removal (Operations)	6.0	0.0	6.0
Sludge Transport/Offloading (Design/Modification/Construction)	4.6	0.3	4.9
Water Treatment (Design/Modification/Construction)	13.5	26.2	39.7
Debris Removal (Design/Modification/Construction)	11.8	5.1	16.9
Debris Removal (Operations)	12.1	1.6	13.7
Site-Wide Spent Fuel Activities	e.	25.0	25.0
Contingency[f]	97.1	9.1	106.2
Deactivation	133.5	0.0	133.5
Sub Total, Common Elements[g]	822.3	851.6	1,673.7
Sludge Treatment[h] (Design/Modification/Construction)	36.6	5.7	42.3
Sludge Treatment/Transport (Operations)[g]	3.7	0.0	3.7
Total[i]	862.6	857.3	1,719.7

Table 10- 1. K Basins Project Cost (continued, footnotes)

a. Costs as of March 31, 1999, rounded to the nearest $100,000 in future worth dollars. For expense dollars, the escalation rate is 2.1% per year. For capital costs, 2.5% per year is used. Note that capital is a very small portion of the remaining cost for the project.
b. Excludes costs incurred prior to this CERCLA ROD date assumed to be October 1, 1999, and costs outside the scope of the CERCLA interim remedial action.
c. Includes Project Fee (profit).
d. Includes maintenance and operation both before and after fuel removal.
e. Not in scope of CERCLA action.
f. Contingency only applies to fiscal year 1999 and beyond. Although shown as a CERCLA cost, it will actually be distributed across both CERCLA and non-CERCLA costs.
g. Subtotal reflects costs common to all of the treatment alternatives.
h. Sludge treatment costs reflected in this cost table were planning estimates prior to the results of the focused feasibility study. The selected alternative in this ROD minimizes sludge costs as part of this CERCLA action. This cost estimate is expected to be revised during remedial design.
i. Does not include cost to dispose of the treated sludge, which is outside the scope of this project.

XI. SELECTED REMEDY

The selected remedy shall satisfy ARARs established in Section 12.2 and meet the remedial action objectives in Section VIII. Facilities used for treatment, storage, or disposal of waste generated as part of this interim remedial action must be approved by EPA via the RDR/RAWP or as otherwise authorized by EPA. An overview of the selected remedy is shown in figure 1.

11.1 Selected Remedy for Spent Nuclear Fuel

SNF will be removed from the K Basins in accordance with the schedule in the Tri-Party Agreement. SNF will be transferred to the CVD facility. The specific activities required under this CERCLA interim remedial action are as follows:

(The SNF will be agitated to loosen and remove sludge and corrosion product; the sludge and corrosion product will be remediated as sludge (Section 11.2).
* The SNF will be placed into fuel baskets, and the fuel baskets will be placed inside MCOs.
* The MCOs will be closed and transferred to the CVD facility in the 100-K Area.
* K Basins water drained from the MCOs will be managed either by returning it to the K Basins or treatment, as necessary, and disposal as described for K Basins water.

The SNF retrieval, washing, and packaging activities at the basins could potentially generate emissions such as airborne particulates. These activities will be conducted under water to control the generation of airborne particulates. The SNF retrieval, washing, packaging, retrieval, and transport shall be designed by DOE and included in the RDR/RAWP subject to EPA approval. Treatment, storage, and disposal of the SNF after it reaches the CVD is outside the scope of this interim remedial action. These activities are subject to requirements of applicable law, including. the *Atomic Energy Act.*

11.2 Selected Remedy for Sludge

Sludge will be removed from the basins in accordance with the schedule requirements of the Tri-Party Agreement. Most of the sludge will be transferred to a permitted storage and treatment facility in the 200 Area. Any storage or treatment at the storage and treatment facility will be outside the scope of this interim remedial action. If it is determined during remedial design that a portion of the sludge could be treated to meet the ERDF waste acceptance criteria, and it is practicable and cost effective, then that treatment will be done as part of this interim remedial action. The treatment for ERDF disposal may take place at either the K Basins or the ERDF. The sludge treatment system as designed by DOE shall be included in an amendment to the RDR/RAWP subject to EPA approval. Treatment shall optimize use of chemical, physical, thermal, and solidification treatment based on the ERDF waste acceptance criteria.

11.3 Selected Remedy for Water

An Integrated Water Treatment System (IWTS) shall be added to each of the basins in accordance with the schedule requirements of the Tri-Party Agreement. The IWTS will clear the water so that reduced visibility does not impede fuel or debris removal activities. The IWTS will provide the necessary collection of contaminated basin water, treatment of the water, and return of treated water to all basin processes that require water, such as canister decapping, fuel retrieval, debris cleaning, and sludge retrieval.

Water will be removed from the basins in accordance with the schedule requirements of the Tri-Party Agreement. The IWTS will meet or be modified, as appropriate, so that treated water meets the ETF waste acceptance criteria. The IWTS-treated water will be pumped into tanker trucks and transported to the ETF. The IWTS as designed by DOE shall be included in the RDR/RAWP subject to EPA approval.

During SNF retrieval, some water will be removed with the SNF and trapped inside the MCOs. When the water is drained from the MCOs during later processing, it may be recycled to the basins and managed with the bulk of the contaminated water. This recycle will help maintain necessary water levels in the basins and reduce the volumes of wastewater generated. Alternately, the water may be treated as necessary and transferred directly to the ETF. Clean water will be added to the basins to maintain the water at the level necessary to cool the SNF and provide radiation shielding in the basins during remedial activities.

The IWTS includes a pre-filter to remove particulate matter and an ion exchange module to remove remaining radioactive contaminants except tritium. Tritium cannot be effectively separated from water. Prior to removal from the basins, water will be sampled to determine if it meets ETF waste acceptance criteria including the criterion for PCBs. If PCBs or other contaminants are detected at concentrations greater than the waste acceptance criteria at ETF, then additional treatment will be added to the IWTS to ensure that water leaving the system meets the waste acceptance criteria for ETF. Water removed from the basin that is above a PCB concentration of 0.5 ppb will be a *Toxics Substances Control Act* (TSCA) regulated waste under 40 CFR 761.79.

ETF operating permits will be modified as necessary before K Basins water is received. The DOE shall submit all necessary information and applications for any modifications of permits in a timely manner to support the Tri-Party Agreement schedule. Note that operation of the ETF is not part of this CERCLA interim remedial action. Contaminants and by-products removed during the treatment process at the ETF are concentrated and dried into a powder. The powder generated at ETF from treating water generated under this interim remedial action is authorized for disposed at the ERDF if it (1) meets the ERDF waste acceptance criteria, (2) the K Basins water is not combined with other liquid effluent whose treatment residue is not authorized for ERDF disposal, and (3) the residue from treatment of K Basins water is not combined with waste that is not authorized for ERDF disposal. Otherwise, the powder will be disposed at another authorized facility as per ETF operating permit(s).

Operation of the IWTS and any other water treatment systems associated with this CERCLA interim remedial action will generate secondary wastes such as ion exchange modules and cartridge filters. Any carbon filters added to provide PCB treatment would be managed as a TSCA-regulated waste upon removal. All other components of the IWTS, such as ion exchange modules, will be managed as debris.

11.4 Selected Remedy for Debris

Debris will be removed from the basins in accordance with the schedule requirements of the Tri-Party Agreement. Debris is solid waste resulting from this CERCLA interim remedial action, excluding SNF, sludge, and wastewater. Debris includes items located both above and below the water in the basins, wastes generated from operation and deactivation of the in-basin water and sludge treatment systems, and wastes generated during basin deactivation. Debris may also be generated during deactivation of sludge treatment facility(ies) or equipment done as part of this CERCLA interim remedial action.

Debris will be removed from the K Basins, treated as appropriate, and disposed at the ERDF as approved by EPA. If the debris cannot be treated to meet ERDF waste acceptance criteria, it will be transferred to a 200 Area waste management facility approved by EPA. If ERDF cannot be used, the EPA would approve use of the Central Waste Complex, Mixed Waste Trench (W-025), Low Level Burial Grounds, Waste Receiving and Processing facility, and T Plant as environmentally protective management facilities for the debris provided this waste and these facilities are managed in accordance with applicable requirements. The scope of this CERCLA interim remedial action for debris is removal from the basins, treatment, transport to ERDF for disposal or alternatively transferring the debris to an approved waste management facility appropriate for the designation. When the debris is received at the storage or disposal facility, further waste management is beyond the scope of this interim remedial action.

Debris will be removed from the basins throughout the course of the K Basins clean out and during deactivation of the basins and sludge treatment systems for this CERCLA interim remedial action. Some debris has been generated and packaged at the K Basins prior to issuance of this ROD. This waste may be disposed of at the ERDF if the packaged waste meets the ERDF waste acceptance criteria. Otherwise, it will be disposed at another 200 Area facility approved by EPA. Debris treatment and disposal as designed by DOE shall be included in the RDR/RAWP subject to EPA approval.

After removal, debris will be designated to determine if it should be handled as solid waste, dangerous waste, low level waste, low level mixed waste, TRU waste, or TRU mixed waste. Debris for which no reuse, recycle, or decontamination option is identified will be assigned an appropriate waste designation (e.g., solid, radioactive, dangerous, mixed).

The debris is regulated as a PCB remediation waste where it has contacted sludge. As the underwater debris is removed from the basins it will be drained of free-flowing liquid and rinsed with water to remove the majority of sludge adhering to the debris. Thereafter, the debris would be managed in accordance with applicable radioactive waste and dangerous waste requirements, but would no longer be designated or managed as a TSCA-regulated waste. The risk-based disposal approval under 40 CFR 761.61(c) is based on the expectation that minimal quantities and concentrations of PCBs will be left on the debris and that management of this waste in accordance with applicable radioactive waste and dangerous waste requirements will be protective of residual PCBs present in the waste. This decision will not pose an unreasonable risk of injury to human health or the environment. Further details on the analysis for this risk-based disposal approval under 40 CFR 761.61(c) is contained in appendix C of the focused feasibility study.

11.5 Selected Remedy for Deactivation

Once the SNF, sludge, water, and debris such as canisters are removed from the K Basins, the basins will be deactivated. Deactivation will be completed in accordance with the schedule requirements of the Tri-Party Agreement. Deactivation will remove additional hazardous materials and place the basins into a condition such that they can be maintained safely with minimal surveillance and maintenance until such time as interim safe storage and/or basin remedial activities are implemented. Deactivation includes the following activities:

- Equipment that is not an integral part of the basin structures will be drained, removed, decontaminated as appropriate, packaged, and disposed of as debris. Such equipment could include components of the SNF retrieval system, the IWTS, and the sludge retrieval system.
- Sludge treatment system equipment and the structure in which it is installed will be removed, decontaminated as appropriate, packaged, and disposed as debris.
- The basin structure will be decontaminated to the extent required to meet criteria for minimal surveillance and maintenance set forth in the remedial design report and remedial action work plan, likely as an amendment.
- Support systems such as electrical, heating, ventilation, and air conditioning, water supply, and monitoring that are not required for future environmental compliance or personnel safety will be de-energized.
- Structural repairs will be made as necessary for future surveillance and maintenance needs.
- Building penetrations will be sealed to prevent entry of animals, and personnel access controls will be maintained or installed by DOE.

Deactivation is several years in the future and activities needed to complete deactivation have not been fully defined. The DOE will amend the RDR/RAWP subject to EPA approval to more fully describe the activities when deactivation planning is complete. The DOE will provide the amendment in a timely manner to support the Tri-Party Agreement schedule.

It is expected that the basins will still be radiologically contaminated at the end of deactivation, but activity levels cannot be estimated at this time. The contamination will be stabilized as part of deactivation to prevent releases to the environment.

11.6 Institutional Controls

After deactivation, air and groundwater monitoring and controls to prevent public access will be established or maintained by DOE as appropriate until such time as final remedial action is completed. Current access controls include signs along the river, an 8-foot fence, locked access to buildings containing the primary hazards, and routine patrols. Institutional controls will be included in the RDR/RAWP subject to EPA approval.

XII. STATUTORY DETERMINATIONS

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that significantly and permanently reduces the volume, toxicity, or mobility of hazardous substances as their principal element. This section discusses how the selected remedy meets these statutory requirements.

The selected remedy provides the best balance of tradeoffs among the alternatives with respect to evaluation criteria that are used to evaluate remedies under CERCLA. The selected remedy will protect human health and the environment by removal of contaminants from the K Basins and transfer to environmentally protective facilities. It will comply with ARARs, is cost effective, and will utilize permanent solutions to the maximum extent practicable. The selected alternative satisfies the CERCLA preference for treatment as a principal element.

12.1 Protection of Human Health and the Environment

The selected remedy provides protection of human health and the environment by removing the contents of the K Basins and placing the hazardous substances in permitted protective facilities. The selected remedy will be conducted in compliance with identified ARARs, to-be-considered (TBC) materials, and As Low As Reasonably Achievable (ALARA) principals to minimize exposure to site workers and releases to the environment.

12.2 Compliance with ARARs and TBC Materials.

The selected remedy will comply with the federal and state ARARs and TBCs identified below. No waiver of any ARAR is being sought. This interim remedial action is part of a final remedial action that will satisfy other ARAR requirements when completed. The chemical, action, and location-specific ARARs identified for the selected remedy are the following:

The requirements for "Designation, Reportable Quantities, and Notification" (40 CFR 302) pursuant to CERCLA are applicable to new releases of CERCLA hazardous substances that occur during the K Basins interim remedial action. If new releases of hazardous substances exceeding the reportable quantities occur, agencies must be notified as appropriate.

The substantive requirements of the "Dangerous Waste Regulations" (WAC 173-303) pursuant to the state *Hazardous Waste Management Act* (70.105 RCW) are applicable for the identification, treatment, storage, and disposal of dangerous and mixed wastes generated during the K Basins interim remedial action. Dangerous waste management activities beyond the scope of the CERCLA action are subject to the full substantive and administrative requirements.

The "Land Disposal Restrictions" (40 CFR 268) pursuant to the *Resource Conservation and Recovery Act* (42 USC 6901, *et seq.*) are applicable for establishing treatment standards and storage requirements prior to disposal of any dangerous or mixed wastes generated as part of the

K Basins interim remedial action. The selected remedy for sludge storage is in accordance with 40 CFR 268.50(e).

The “Regulation of PCBs” (40 CFR 761) pursuant to the *Toxic Substances Control Act* (15 USC 2601, *et seq*.) is applicable to the management of sludge and debris removed from the K Basins. The sludge has been determined to be a PCB remediation waste and must be marked, stored, treated, and disposed in accordance with the PCB remediation waste requirements. Debris has been determined to be a PCB remediation waste where it has contacted sludge. This regulation is not applicable to debris that is treated as described in the selected remedy which includes a risk-based disposal approval as per 40 CFR 761.61(c). This regulation is not applicable to water leaving the basin systems after the water is treated as described in the selected remedy to below 0.5 ppb.

The “Nuclear Regulatory Standards for Protection Against Radiation” (10 CFR 20) pursuant to the *Atomic Energy Act* (42 USC 2011, *et seq*.) and the “Radiation Protection Standards” (WAC 246-221) pursuant to the *State of Washington Radiation Protection Requirements* (70.98 RCW) are relevant and appropriate to establishing public dose limits for activities implemented under the K Basins interim remedial action. Relevant and appropriate requirements are that the dose to an individual member of the public cannot exceed 0.1 rem/year (100 mrem/year) total effective dose equivalent and 2 mrem/hr from external exposure in unrestricted areas.

The substantiative requirements in “Licensing Requirements for Land Disposal of Radioactive, Waste” (10 CFR 61) pursuant to the *Atomic Energy Act* are relevant and appropriate to radioactive waste generated by the K Basins interim remedial action and taken for disposal at the Hanford Site. Relevant and appropriate requirements are the general prohibition on near-surface disposal of greater-than-Class-C radioactive waste and the general performance objectives stated in 10 CFR 61.40.

The “Environmental Radiation Protection Standards for Nuclear Power Operations” (40 CFR 190) pursuant to the *Atomic Energy Act* are relevant and appropriate to the public dose associated with activities conducted as part of the K Basins interim remedial action. Relevant and appropriate requirements are those that limit dose to 25 mrem/year to whole body, 75 mrem/year to thyroid, and 25 mrem/year to any other organ.

The “Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste” (40 CFR 191) pursuant to the *Atomic Energy Act* are applicable to the SNF and TRU waste generated by the K Basins interim remedial action. On-site disposal of these materials is prohibited by this regulation.

The “Department of Energy Occupational Radiation Protection” (10 CFR 835) is applicable to all activities undertaken as part of the K Basins interim remedial action and establishes a worker dose limit of 5 rem/year total effective dose equivalent.

The “Hazardous Materials Regulation” (49 CFR 171) and “Hazardous Materials Tables” (49 CFR 172) pursuant to the *Hazardous Materials Transportation Act* (49 USC 1801-1813) are applicable to any offsite transportation of potentially hazardous materials, including samples and wastes generated by the K Basins interim remedial action.

The “Radiation Protection Air Emissions” (WAC 246-247) and the “National Emissions Standards for Hazardous Air Pollutants” (40 CFR 61) are applicable to airborne emissions of radionuclides. The standard applies to the Hanford Site as a whole. Airborne emissions from K Basins activities must not cause the cumulative site emissions to exceed the site public dose limit of 10-mrem/year effective dose equivalent. In addition, WAC 246-247 requires a demonstration of best available radionuclide control technologies and monitoring as appropriate. The “Ambient Air Quality Standards and Emission Limits for Radionuclides” (WAC 173-480) are also applicable to airborne ermissions of radionuclides. However, the limits of WAC 246-247 are more restrictive. The DOE has been demonstrating compliance with WAC 246-247 via the notice of construction (NOC) process with EPA and the Washington State Department of Health. The administrative requirements of WAC 246-247 are not an ARAR, so if in the future, the DOE determines that meeting the administrative requirements of the NOC process may jeopardize timely performance, of this interim remedial action, the DOE may seek EPA approval to meet the substantiative but not the administrative requirements of WAC 246-247.

The “National Emissions Standards for Asbestos, Standard for Demolition and Renovation” (40 CFR 61.145-150) are applicable to management of asbestos-containing materials that might be generated during deactivation of the K Basins.

The “Controls for New Sources of Toxic Air Pollutants” (WAC 173-460) are applicable to airborne emissions of toxic air pollutants from new and modified activities conducted at the K Basins. Quantities of toxic emissions must be quantified to establish acceptable levels, and best available control technologies must be applied.

The *National Historic Preservation Act* (16 USC 470, *et. seq*.) and implementing regulations are applicable to those activities associated with the K Basins interim remedial action that might affect properties in the 100-K Area that may be eligible for listing on the National Register of Historic Places. Appropriate protection of those properties is required.

The *National Archeological and Historical Preservation Act* (16 USC 469a) and implementing regulations are applicable to those activities associated with the K Basins interim remedial action that might affect archeological or historic data in the 100-K Area. Appropriate responses are required in the event that artifacts are discovered.

The *Endangered Species Act* (16 USC 1531, *et. seq*.) and implementing regulations are applicable to those activities associated with the K Basins interim remedial action that might jeopardize any threatened or endangered species or habitats in the 100-K Area. Appropriate actions must be taken to protect species and habitats.

The *Hanford Reach Study Act* (Public Law 100-605, as amended) is applicable because the K Basins interim remedial action takes place near the Columbia River and requires minimizing and providing mitigation for direct and adverse impacts on the river.

Other criteria, advisories, or guidance to be considered for the K Basins interim remedial action are the following:

Public dose limits of 100 mrem/year total effective dose equivalent proposed under the "Radiation Protection of the Public and the Environment"(10 CFR 834, proposed at 58 FR 16268) are to be considered as limits for activities undertaken as part of the K Basins interim remedial action. Note that these TCB standards are the same standards as enforceable NRC and State ARARs identified in this section.

The *Environmental Restoration Disposal Facility Waste Acceptance Criteria* is to be considered in determining whether waste generated by the K Basins interim remedial action can be disposed at the facility.

12.3 Cost Effectiveness

The selected remedy provides overall effectiveness proportion to its cost. Treatment for final disposal of the K Basin sludge as a unique waste stream could not be cost effectively performed within the scope of this interim remedial action. Therefore sludge will undergo minimal treatment necessary to support its interim storage in the 200 Area for future final treatment as part of a much larger waste stream. The selected remedy takes advantage of economies of scale by treating the K Basin sludge as part of the much larger quantity of remote-handled TRU waste at Hanford.

12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy utilizes a permanent solution to mitigate the potential to release hazardous substances from the K Basins by removing their contents. The process of SNF retrieval, washing, loading in baskets, and loading into multi-canister overpacks utilizes numerous innovative remotely operated equipment. Sludge that is treated and disposed at the ERDF will be a permanent solution for that sludge. The remaining sludge will be treated outside the scope of this interim remedial action. Water will be treated in the basins as part of this interim remedial action, and then transported to the ETF for final treatment and disposal beyond the scope of this interim remedial action. Debris, including deactivation waste, that is removed from the basins, treated as appropriate, and disposed at the ERDF will be a permanent solution for debris.

12.5 Preference for Treatment as a Principal Element

The SNF, and its degradation products in the sludge, water, debris and deactivation waste are principal threats, as the term is defined in EPA guidance. While the selected remedy does not provide significant treatment of the SNF and sludge (except sludge treated for disposal at the ERDF), the selected remedy does include transferring SNF and sludge to facilities where the waste will be treated. In addition, the selected remedy does provide treatment of the water at the basins, and transport to the ETF for final treatment. Debris, including deactivation waste, and any other waste for disposal at the ERDF will be treated, as appropriate, to meet ERDF waste acceptance criteria. The final remedy for the principal threat wastes that is beyond the scope of this interim remedial action will involve treatment.

12.6 CERCLA Section 104(d)(4) Determination

The preamble to the NCP indicates that when non-contiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows waste transfer between such non-contiguous facilities without having to obtain a permit. The 100 K Area and the 200 Area are treated as one site for response purposes. This is consistent with all previous Hanford 100 Area RODs which required transfer of waste to the 200 Area.

12.7 Off-Site Rule

Some waste generated by the K Basins CERCLA action might be transported offsite for treatment or disposal, if offsite facilities provide a capability that is not available onsite. (For example, debris such as SNF canisters with a high dose rate may be sent to a permitted off site commercial facility with a shielded crusher. After crushing, the debris would be returned to the Hanford Site for disposal at the ERDF.) Under 40 CFR 300.440(a)(4), EPA must determine the acceptability of any offsite facility selected for the treatment, storage, or disposal of CERCLA waste. In determining acceptability, EPA will consider the facility’s compliance status and any releases from the facility. The need to utilize offsite facilities for waste generated by this CERCLA action has not been established at this time. If such need is identified in the future, DOE will be required to obtain a determination of acceptability from EPA.

XIII. DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The sludge treatment alternatives were developed with the intent of treating the K Basins sludge as necessary for interim storage prior to final treatment and disposal. The feasibility study showed there were implementability issues and high costs (see table 91) for all of the treatment alternatives. The proposed plan stated that the implementability issues might best be addressed by placing the sludge into interim storage, with treatment sufficient to meet interim storage requirements. The interim storage would be at 200 Area permitted facilities. The sludge could then be treated to meet final storage and disposal requirements at a later time. Treatment of PCBs is specified in the proposed plan as a necessary step to meet interim storage requirements prior to final treatment and disposal. The selected remedy does not include such treatment because PCB treatment is will not be necessary to meet interim storage requirements due to changing acceptance criteria at the facilities. The selected remedy could have been reasonably anticipated from the preferred alternative in the proposed plan regarding sludge treatment.

The selected remedy is different from the preferred alternative in the following ways:

* Sludge treatment prior to interim storage in the 200 Area has been moved outside the scope of the interim remedial action.
* PCBs in sludge will not be treated prior to interim storage. Thus, at the conclusion of this interim remedial action, the sludge will still be a PCB remediation waste, as defined and regulated by TSCA. Sludge will be stored as PCB/radioactive waste as per TSCA 40 CFR 761.65(a), which specifies that the usual 1-year storage limit for PCB waste does not apply to PCB/radioactive waste if certain provisions are met.
* Further analysis of the waste acceptance criteria for double-shell tanks indicated the tanks would be a less viable option than portrayed in the proposed plan, due to implementability and cost. Therefore, the sludge storage facility will likely be a facility other than double-shell tanks.
* Ongoing evaluation of the safety issues related to interim storage of the sludge have made storage without treatment a more viable option within the selected remedy than portrayed in the proposed plan.

RESPONSIVENESS SUMMARY

I. STAKEHOLDER ISSUES AND EPA RESPONSES

Six individuals provided public comment in the form of five written comment letters and one oral comment. There were 11 main ideas contained in the comments. They are identified by number below, including the EPA response.

(1) *The experience and lessons learned from the clean out and deactivation of the N Reactor Basin should be fully utilized for the K Basin effort.*

The N reactor at Hanford contains a fuel storage basin that contained SNF, sludge, water, and debris. That basin has recently undergone a clean out and deactivation. A document titled, "Innovative Work Practices and Lessons Learned at the N Area Deactivation Project", was published in January 1999 by the contractor who conducted the N Basin work, and is included in the Administrative Record. This document was reviewed in detail during a formal Lessons Learned session with managers for the deactivation and sludge projects in the K Basins SNF Project. Resolution of a number of issues encountered at N Basin will benefit the work to be done at K Basins. In addition, the SNF Project is using some of the same personnel who worked on the N Basin remediation. The SNF Project managers will maintain communication with the N Basin clean out and deactivation managers over the course of the fuel removal and remediation of K Basins.

(2) *All opportunities for early removal of debris or sludge should be used.*

The legally-enforceable schedule for the K Basins project has SNF removal preceding sludge and debris removal. However routine operations and initial cleanup activities have been removing debris, for example 2,000 empty canisters were removed in 1998. It is anticipated that debris removal will be an ongoing activity as it simplifies basin operations. The sludge that is anticipated to be the most chemically reactive and most radioactive is the sludge produced during the fuel washing. This sludge will be captured by the IWTS and stored in settling tanks in the basin which provide additional isolation from the environment. For the K-West basin this will be nearly all of the sludge. For the K-East basin, we continue to examine the feasibility of removing a portion of the sludge prior to SNF removal if the necessary steps to get it to and received at a 200 Area facility are in place in time. Regardless of whether early sludge removal is achieved, there will be sludge within and under fuel canisters and debris that won't be accessible until the final stages of the K Basins project.

(3) *As much sludge as possible should be treated to final disposal requirements to minimize interim storage. (See answer to comment #4).*

(4) *The sludge option for minimal treatment and disposal at the ERDF or transfer to double-shell tanks should be utilized to the maximum extent and as soon as possible.*

Although actual costs for interim storage of K Basins sludge in the 200 Area have not been estimated, it will be expensive based on experience with storing other wastes at Hanford. Therefore, financially viable opportunities to isolate non-TRU fractions for treatment and final disposal in the ERDF will be pursued. Sludge will be stored in existing permitted facilities in the 200 Area to avoid the cost of building a new facility. TRU sludge that can easily be accepted into double-shell tanks will be (although at this time this does not appear to be probable). Financially viable opportunities to treat sludge for final disposal to WIPP and avoid interim storage will be pursued (although at this time this does not appear to be probable).

(5) *What level of quality assurance will DOE use for the K Basins project to protect the public?*

The DOE has classified the K Basins as a nuclear facility. DOE requires the contractor responsible for a nuclear facility to conduct its work in accordance with a quality assurance program that meets the criteria of 10 CFR §830.120. The criteria of 10 CFR §830.120 are applied to facility systems and components using a graded approach. The graded approach ensures the appropriate level of quality assurance is applied based on factors such as relative importance to safety and the magnitude of any hazard involved. The contractor is also required by 10 CFR §830.120 to use appropriate standards to develop and implement its quality assurance program. The standards which the SNF Project uses to develop and implement its quality assurance program include the American Society of Mechanical Engineers NQA-1 standard and the DOE Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description DOE/RW/0333P standard. Using the graded approach, the SNF Project Quality Assurance Program applies requirements from these quality assurance standards to protect workers, the public, and the environment.

(6) *Support was expressed to conduct the remedial action to protect the environment including the Columbia River from releases from the basins.*

There has been strong community support to conduct the interim remedial action to remove the material and waste from the K Basins.

(7) *Minimize infrastructure development for sludge treatment.*

In July 1999, the Department of Energy approved a sludge treatment path forward recommendation. The recommendation included integrating sludge treatment with other similar waste at the Hanford Site. This recommendation is consistent with the goal of minimizing infrastructure development. This approach allows for separation of different fractions of sludge, and treating each fraction as appropriate. The approach also provides the flexibility to separate and store sludge in a safe and environmentally sound manner. This interim storage allows for a sitewide economy of scale by developing a treatment process to deal with the K Basin sludge in the same manner as other transuranic waste on the Hanford Site rather than building a facility solely for the purpose of treating K Basin sludge. The consolidation of K Basin sludge with other similar waste on the Hanford Site provides opportunities for infrastructure minimization on a Sitewide basis.

(8) *Minimize waste going to the ERDF to minimize ERDF's expansion into sage/steppe habitat.*

Regarding minimizing waste going to the ERDF to minimize the footprint of the ERDF on the habitat, the volume of waste from the K Basins action is very small relative to other cleanup projects. The environmental benefit resulting from removal of waste from the K Basins outweighs the contribution of this action to the habitat impact in the 200 Area.

(9) *Conduct the project in a manner that protects ecological and cultural resources.*

An ecological and cultural resource review was done as part of the K Basins EIS and Supplement Analysis. The EIS concluded that no threatened or endangered species or cultural resources would be directly affected by construction activities. The analyses and decisions made in the EIS were adopted into the Focused Feasibility Study.

Additionally, as the K Basin Interim Remedial Action proceeds, DOE must comply with all applicable or relevant and appropriate requirements. These requirements include the *National Historic Preservation Act, the National Archeological and Historical Preservation Act*, and the *Endangered Species Act*. Compliance with these requirements will ensure that the cultural and ecological resources are appropriately protected.

(10) *Explain how releases from the basins will be addressed.*

This topic is covered in Section IV "Scope and Role of Response Action Within Site Strategy" of this ROD.

(11) *Lack of technical specifics or cost for sludge storage made public comment difficult. The DOE should have known by now what to do with the sludge.*

The DOE did have a baseline chemical treatment process for the sludge treatment. However, it was not until sludge characterization was completed and the baseline process was further developed, that the full cost of the chemical treatment process could be calculated. It was the high cost of treating all of the sludge via the baseline process that led to additional analysis to find a better, more cost effective way to manage sludge.

Specific technical details were not available for many of the alternatives in the Focused Feasibility Study since treating the sludge is a unique application of these technologies that involves extensive development prior to implementation. The DOE did not have a completed Conceptual Design Process for the various alternatives prior to the submittal of the Feasibility Study and Proposed Plan and therefore the design details were not available. Based on the information analyzed, however, the DOE concluded that utilizing one single process for all of the K Basin sludge streams would be very expensive and not cost effective. The preferred alternative, as specified in the Proposed Plan, was developed to allow the use of combinations of treatment alternatives to maximize flexibility and minimize costs. This alternative also includes an interim storage period that will allow for a sitewide economy of scale by developing a treatment process to deal with the K Basin sludge in the same manner as other transuranic, material on site.

II. TECHNICAL AND LEGAL ISSUES

The technical issues were covered in the above comments and responses. There were no legal issues.

GLOSSARY

Canister Storage Building - A new facility located in the 200 East Area of the Hanford Site that will be used for underground vault storage of SNF.

Central Waste Complex - A RCRA interim status mixed waste treatment and storage facility located in the 200 West Area of the Hanford Site..

Cold Vacuum Drying Facility - A facility located in the 100-K Area that will be used for drying SNF to make it safe for interim storage at the canister storage building.

Deactivation - Actions taken to place a facility into a radiologically and environmentally safe condition such that it can be decontaminated and decommissioned at a later date.

Double-Shell Tanks - RCRA interim status underground tanks located in the 200 East and 200 West Areas of the Hanford Site. Tanks are double-contained and have leak detection capabilities.

Environmental Restoration Disposal Facility - A near-surface landfill located in the 200 West Area, designed for permanent disposal of wastes generated under Hanford Site CERCLA documents. The ERDF is double-lined and was authorized via a 1995 CERCLA ROD.

Effluent Treatment Facility - A RCRA-permitted wastewater treatment facility in the 200 East Area of the Hanford Site. Liquid radioactive and mixed waste is treated to meet discharge standards for disposal to the soil.

Low Level Burial Grounds - Unlined, near-surface landfills located in the 200 East and 200 West Areas of the Hanford Site, designated for disposal of low-level radioactive wastes. The low-level burial grounds are RCRA interim status units but are no longer allowed to receive dangerous or mixed wastes.

Mixed Waste Trench (W-025) - A RCRA interim status near-surface landfill located in the 200 West Area of the Hanford Site, designated for storage and disposal of mixed wastes. The mixed waste trench is double-lined.

TRU waste - A radioactive waste that contains greater than 100 nanocuries per gram of transuranic radionuclides with a half life of greater than 20 years. TRU waste will ultimately be disposed off-site at the WIPP.

T Plant - A RCRA interim status mixed waste treatment and storage facility located in the 200 West Area. It is currently used as a decontamination facility, but is a potential sludge storage and treatment facility.

Waste Receiving and Processing Facility - A RCRA interim status storage and treatment facility located in the 200 West Area. It is used specifically to package and treat TRU and mixed TRU wastes.

Waste Isolation Pilot Plant - A RCRA-permitted deep geologic disposal facility for TRU waste located in New Mexico.